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New evidence for the idea of timescale invariance of relaxation processes in simple liquids: The case of molten sodium

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Abstract

The idea of the timescale invariance of relaxation processes in liquids (Yulmetyev et al 2001 Phys. Rev. E 64 057101; 2002 JETP Lett. 76 147) is used to analyse the short-wave collective excitation in liquid sodium, as recently measured by means of very-high-energy-resolution inelastic x-ray scattering (Scopigno et al 2002 Phys. Rev. E 65 031205). The dynamic structure factor, S(Q, ω), calculated on the basis of this idea is in very good agreement with the experimental data in the wavevector range from 1.5 to 14.6 nm-1, where pronounced collective excitations exist. The frequency dependence of the non-Markovity parameter ∈i,(Q, ω) (i = 1, 2, 3, 4) allows us to reveal the alternation of the amplification and the decay of non-Markovity effects for the observed region of wavevector Q.

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